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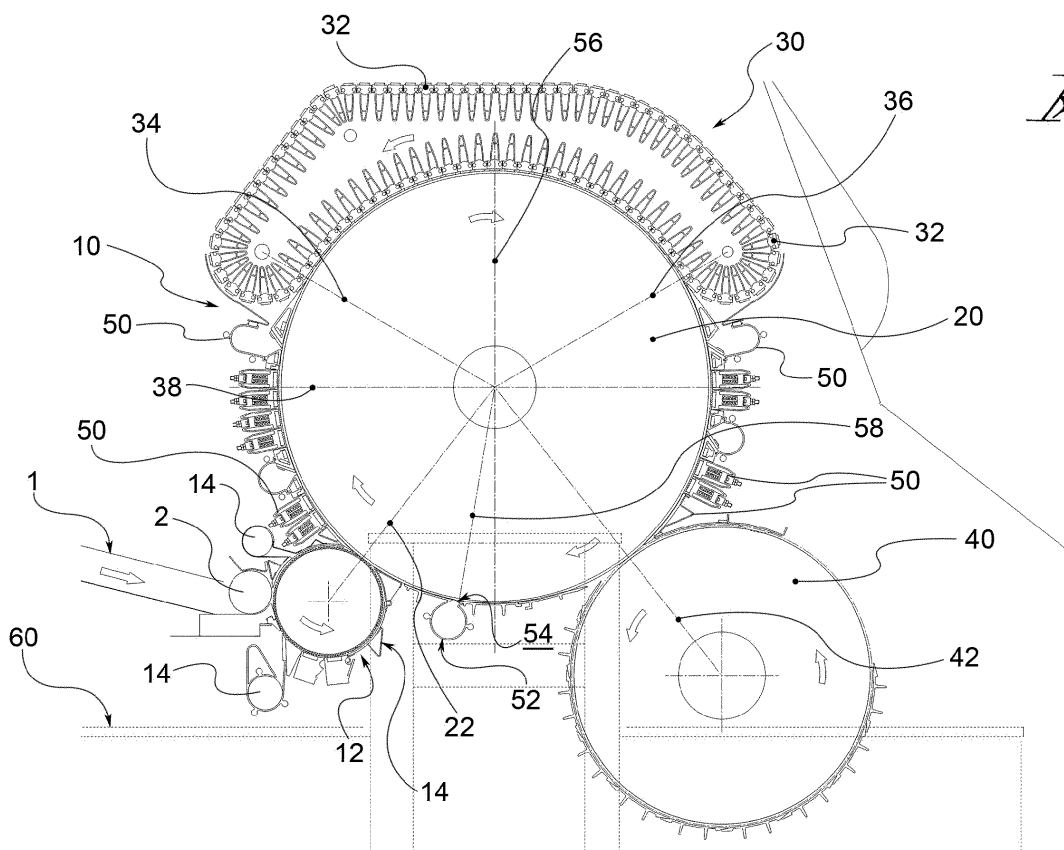
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(54) **Carding machine of a yarn spinning line**

(57) A carding machine (10) comprises a briseur (12), a cylinder (20) and a doffer (40). The active carding surface of the machine is particularly extensive, equal to about 3.77 m². In particular the lower post-carding zone has an angular width of 52°, the lower pre-carding zone

has an angular width of 52°, the total carding zone has a width of 284°, the area under the cylinder has an angular width of 76°. The working height of the machine is 1518 millimetres. The working diameter of the cylinder is 1006 millimetres.



Description

[0001] The present invention relates to a carding machine of a yarn spinning line.

[0002] On a yarn spinning line the fibre, for example in tufts, is first picked from bales, subjected to cleaning and opening operations, and forwarded for carding.

[0003] Carding, as known, is an operation of primary importance, in that the fibre fed in tufts, is further cleaned and parallelised, coming out in web form for subsequent processing.

[0004] In the textile machinery sector of fibre processing high levels of productivity must be achieved on account of the high investment costs in the machinery, costs of labour and raw materials and increasingly low sales prices.

[0005] Research in the sector is therefore targeted at making machinery able to ensure high productivity while maintaining other characteristics unaltered such as the high quality of the finished product, safety conditions, reduced consumption etc.

[0006] For example, document EP-A-0866153 illustrates a carding machine fitted with a cylinder having a diameter of 700 to 1000 millimetres and a working width of about 1500 millimetres.

[0007] The purpose of the present invention is to make a carding machine able to achieve high levels of productivity.

[0008] Such purpose is achieved by a carding machine according to claim 1.

[0009] The characteristics and advantages of the carding machine according to the invention will be evident from the description below, made by way of a non-limiting example according to the attached figures, wherein:

[0010] - figure 1 shows a carding apparatus according to the present invention, comprising a feed silo, a carding machine and a coiler group;

[0011] - figure 2 shows a diagram of the carding machine in figure 1; and

[0012] - figure 3 shows a diagram of a support frame of the machine in figure 2.

[0013] According to the invention, a carding apparatus 100 on a yarn spinning line comprises a feed silo 102 for depositing the fibre in tufts.

[0014] The feed silo 102 comprises an upper chamber 104, generally vertical, onto which an entry duct 106 opens which takes the fibre in tufts coming from the machine upstream, and a pair of counter-rotating introduction cylinders 108, 110 downstream of the upper chamber 104.

[0015] The silo 102 further comprises a lower chamber 112 for the formation of a pad of fibre tufts, generally inclined, downstream of the introduction cylinders 108, 110, and a pair of counter-rotating extraction cylinders 114, 116, downstream of the lower chamber 112.

[0016] The fibre in tufts, which arrives in a whirl from the entrance duct 106 in a current of air, deposits firstly in the upper chamber 104 and is then introduced in the

lower chamber 112, forming a tuft pad.

[0017] The carding apparatus 100 further comprises a carding machine 10, downstream of the feed silo 102, for carding the tufts and obtaining a web, later sent for subsequent processing.

[0018] In particular the carding machine 10 is suitable for processing cotton cut fibres, that is to say fibres of a length of about 25 to 65 millimetres.

[0019] The carding machine 10 comprises a feed duct 1, connected downstream of the introduction cylinders 114, 116, generally inclined downwards in the direction of advancement of the tufts, and a feed cylinder 2, placed at the end downstream of the feed duct 1, to facilitate the feeding downstream of the fibre tufts.

[0020] In addition, the carding machine 10 comprises an introduction cylinder 12 or briseur, rotating on command and faced on the surface, operatively engaged with the feed duct 1 and with the feed cylinder 2 to withdraw the fibre tufts and place them in rotation on its lateral surface.

[0021] Preferably, the briseur has a working diameter, that is a diameter measured bearing in mind the height of the tips of the surface facing, greater than 150 mm and less than 400 mm, preferably greater than 175 mm and less than 350 mm, preferably greater than 255 mm and less than 300 mm, specifically equal to 256 mm.

[0022] Preferably, the carding machine 10 comprises briseur accessories 14, such as suction inlets, fixed carding sectors and peripheral covers, positioned peripherally to the briseur 12.

[0023] In addition, the carding machine 10 comprises a main carding cylinder 20, downstream of the briseur 12. The cylinder is faced on the surface rotating on command and counter-rotating to the briseur, and operatively engaged with the surface of the latter, to pick up the fibre.

[0024] Preferably, the working diameter of the cylinder 20 is greater than 800 mm and less than 1350 mm, preferably greater than 1000 mm and less than 1200 mm, specifically equal to 1006 mm.

[0025] A straight line passing through the centre of the cylinder and the centre of the briseur defines a diametrical briseur-cylinder transfer line 22, in that, at its intersection with the outer work surface of the cylinder, an area is formed in which the fibre migrates from the surface of the briseur to the surface of the cylinder.

[0026] In addition, the carding machine comprises a movable flats device 30 comprising a plurality of flats 32, translating along a closed circuit comprising a working section parallel to the work surface of the cylinder 20.

[0027] In relation to the cylinder 20, the working section of the movable flats device extends from an initial line 34, defined as the straight line passing through the centre of the cylinder and the point of the working circumference of the cylinder where the translating flats 32 disengage from the cylinder, and an end line 36, defined as the straight line passing through the centre of the cylinder and the point of the working circumference of the cylinder where the translating flats 32 begin engagement with the

cylinder. The zone of the lateral surface of the cylinder between the initial line and the end line is defined the main carding zone.

[0028] Preferably, the main carding zone has an angular extension of 80° to 150°, preferably 90° to 140°, preferably 100° to 130°, preferably equal to 120°.

[0029] The zone of the cylinder 20 contained between the initial line 34 and the briseur-cylinder transfer line 22 defines a total pre-carding zone; the zone of the cylinder 20 contained between the initial line 34 and the diametrical horizontal line 38 defines an upper pre-carding zone; the zone of the cylinder 20 contained between the diametrical horizontal line 38 and the briseur-cylinder transfer line 22 defines a lower pre-carding zone.

[0030] The lower pre-carding zone has an angular width of more than 40°, and less than 60°, preferably more than 45° and less than 55°, preferably equal to 52°.

[0031] In addition, the carding machine 10 comprises an extraction cylinder or doffer 40, downstream of the cylinder 20.

[0032] The doffer 40 is faced on the surface, rotating on command and counter-rotating to the cylinder, and operatively engaged with the surface of the latter, to pick up the fibre.

[0033] Preferably, the working diameter of the doffer 40 is greater than 650 mm and less than 750 mm, preferably greater than 705 mm and less than 730 mm, specifically equal to 700 mm.

[0034] A straight line passing through the centre of the cylinder and the centre of the doffer defines a diametrical cylinder-doffer transfer line 42, in that, at its intersection with the outer work surface of the cylinder, an area is formed in which the fibre migrates from the surface of the cylinder to the surface of the doffer.

[0035] The zone of the cylinder 20 contained between the end line 36 of the main carding zone and the cylinder-doffer transfer line 42 defines a total post-carding zone; the zone of the cylinder 20 contained between the end line 36 of the main carding zone and the horizontal line 38 defines an upper post-carding zone; the zone of the cylinder 20 contained between the horizontal line 38 and the cylinder-doffer transfer line 42 defines a lower post-carding zone.

[0036] The lower post-carding zone has an angular width of more than 50°, preferably equal to 52°.

[0037] The zone of the cylinder 20 contained between the cylinder-doffer transfer line 42 and the briseur-cylinder transfer line 22, in the sequence now said and in the direction of rotation of the cylinder, forms a zone under the cylinder.

[0038] Preferably, the area under the cylinder has an angular width of more than 70° and less than 100°, preferably greater than 75° and less than 90°, specifically equal to 76°.

[0039] The cylinder zone defined between the briseur-cylinder transfer line 22 and the cylinder-doffer transfer line 42 in the sequence now said and in the direction of rotation of the cylinder, forms a total carding zone.

[0040] The total carding zone has an angular width of more than 255° and less than 290°, preferably more than 280° and less than 285°, specifically equal to 284°.

[0041] In addition, the carding machine 10 comprises a set of cylinder accessories 50, such as suction inlets, fixed carding sectors and peripheral covers, positioned peripherally to the cylinder 20.

[0042] For example, in the pre-carding and /or in the post-carding zone fixed carding sectors are positioned interspersed by suction inlets.

[0043] Preferably, the carding machine 10 comprises at least one accessory under the cylinder, positioned in the area under the cylinder, suitable for operating on the air transported in the area under the cylinder.

[0044] For example, the carding machine 10 comprises at least one suction inlet 52 under the cylinder, having a suction inlet 54 facing towards the surface of the cylinder.

[0045] A vertical plane passing through the centre of the cylinder defines a vertical diametrical line 56, while a plane passing at its apex upstream of the suction inlet 54, in the direction of rotation of the cylinder, defines a suction line 58 under the cylinder.

[0046] Preferably, the suction line 58 under the cylinder is downstream of the vertical diametrical line 56, that is, proximal to the briseur and distal from the doffer.

[0047] The angular width of the area between the vertical diametrical line 56 and the suction line 58 under the cylinder, is 0° (apex of the inlet 54 on the vertical diametrical line) to 20°, preferably 5° to 15°, preferably about 9°.

[0048] According to one embodiment variation (not shown), the suction line under the cylinder is upstream of the vertical diametrical line.

[0049] The working height of the carding machine is defined by the length of the cylinder along the rotation axis.

[0050] Preferably, the working height is 1000 mm to 2000 mm, preferably 1200 mm to 1700 mm, preferably greater than 1300 millimetres, preferably equal to 1518 mm.

[0051] The carding machine 10 further comprises a support frame 60 to support the briseur, the cylinder and the doffer.

[0052] In particular the frame 60 comprises an entrance frame 66 to support the briseur, a central frame 64 to support the cylinder 20, and an exit frame 62 to support the doffer, each formed of respective columns axially spaced, that is in the direction of the working height.

[0053] For the correct positioning of the briseur and of the doffer in relation to the cylinder, the central frame 64 extends vertically at a greater height than that of the entrance and exit frames alongside it.

[0054] In addition, the frame 60 comprises reinforcement cross-members 68 which axially join the columns, to stiffen the structure.

[0055] In addition, the carding machine 10 comprises transmission organs for the transmission of movement

from the electric motors to the briseur, to the cylinder and to the doffer; said transmission organs being connected to the sides of the briseur, of the cylinder and of the doffer above working height in such a way as to prevent interference with the frame 60, and especially to prevent any structural interference with the columns of the central frame 64 and with the cross-members 68.

[0056] Lastly, the carding apparatus 100 comprises a coiler group 200 downstream of the carding machine 10, to collect the web in cans.

[0057] Innovatively, the carding machine according to the present invention makes it possible to achieve high productivity, while maintaining the characteristics of reliability unaltered.

[0058] In particular, the carding machine has an extensive total carding surface, despite maintaining the stiffness quotient of the support frame high.

[0059] Defined As as the width of the total carding zone (in radians), D1 the working diameter of the cylinder (in millimetres) and L1 the working height of the cylinder, the total carding surface S (in m²) may be found using the formula:

[0060]

$$S = A_s * D1/2 * L1 * 10^{-6}$$

[0061] In the preferred embodiment of the carding machine according to the invention, wherein:

$$A_s = 284^\circ$$

$$D1 = 1006 \text{ mm}$$

$$L1 = 1518 \text{ mm}$$

the total carding surface is approximately 3.77 m², greater than the carding surface of any other carding machine for cotton cut fibres known today, maintaining high rigidity characteristics.

[0062] In particular, the lower pre-carding zone has an angular extension sufficiently pressed to maximise the carding surface and keep the formation chamber of the pad in the feed silo (limiting the total height of the silo) sufficiently high.

[0063] In other words, in making the carding apparatus, the height of the upper well Hs and the total height of the lower well Ht and of the feed duct, above the minimum values, to ensure that the fibre in tufts is correctly deposited in the upper well and that in the lower well and in the feed duct a sufficiently ordered and homogeneous fibre pad is formed to improve the processing performed by the carding machine.

[0064] Having set the total height of the feed silo according to system constraints, the lower pre-carding zone has an angular extension sufficiently pressed to keep the upper well, the lower well and the feed duct sufficiently high for the correct formation of the pad.

[0065] At the same time, the lower pre-carding zone

has an angular extension sufficiently limited to not jeopardise the structural robustness of the support frame, and in particular, the central frame.

[0066] The lower post-carding zone has an angular extension sufficiently pressed to maximise the carding surface and optimise the transfer of fibre between the cylinder and the doffer, but sufficiently limited to not jeopardise the structural robustness of the support frame, and in particular of the central frame.

[0067] According to a further advantageous aspect, the working diameter of the cylinder is sufficient for having an extensive carding surface, but limited enough to contain the entity of the centrifugal forces operating on the outer casing. Such centrifugal forces, when too high, tend to form radial expansions of the casing of too great an entity and unevenly along the height of the same, as well as imposing the realisation of more robust supports for the cylinder.

[0068] In addition, the diameter is sufficiently elevated so that, for the same carding surface S and working height L1, the width of the total carding zone As is limited enough to avoid the structural drawbacks spoken of.

[0069] Advantageously, in addition, the carding machine makes it possible to operate on the air generated by the rotation of the cylinder in the zone under the cylinder, making use of every available surface between the briseur and the doffer.

[0070] It is clear that a person skilled in the art may make modifications to the carding machine described above so as to satisfy contingent requirements while remaining within the sphere of protection of the following claims.

Claims

1. Carding machine (10) of a line preparing fibre for spinning, comprising:

a briseur (12) rotatable for taking the fibre in tufts from an upstream feed silo;
a cylinder (20) counter-rotating in relation to the briseur (12), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and
dragging said fibre in rotation onto its own lateral surface; and
a doffer (40) counter-rotating in relation to the cylinder (20), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and
dragging said fibre in rotation onto its own lateral surface;

wherein:

a horizontal plane passing through the centre of the cylinder (20) defines a horizontal diametrical

- line (38);
the straight line passing through the centre of the cylinder (20) and the centre of the briseur (12) defines a briseur- cylinder transfer line (22); and
the straight line passing through the centre of the cylinder (20) and the centre of the doffer (40) defines a cylinder-doffer transfer line (56); and wherein the lower post-carding zone angularly defined between the horizontal diametrical line (38) and the cylinder-doffer transfer line (42), has an angular width of more than 50°, preferably 52°.
2. Machine according to claim 1, wherein the lower pre-carding zone defined between the horizontal diametrical line and the briseur-cylinder transfer line (22), has an angular width of more than 40°, and less than 60°, preferably more than 45° and less than 55°, preferably equal to 52°.
 3. Machine according to claim 1 or 2, wherein the area under the cylinder defined between the cylinder-doffer transfer line (42) and the briseur-cylinder transfer line (22), in the sequence now said and in the direction of rotation of the cylinder, has an angular width of more than 70° and less than 100°, preferably more than 75° and less than 90°, specifically equal to 76°.
 4. Machine according to any of the previous claims, comprising at least one accessory under the cylinder positioned in the area under the cylinder defined between the cylinder-doffer transfer line (42) and the briseur-cylinder transfer line (22), in the sequence now said and in the direction of rotation of the cylinder, said accessory being suitable to operate on the air under the cylinder.
 5. Machine according to claim 4, comprising at least one suction inlet (52) under the cylinder, having a suction inlet (54) facing towards the surface of the cylinder.
 6. Machine according to claim 5, wherein the angular width of the area between a vertical diametrical line (56) and suction line (58) under the cylinder, passing at its apex upstream of the suction inlet (54), is 0° to 20°, preferably 5° to 15°, preferably about 9°.
 7. Machine according to any of the previous claims, wherein the working height is 1000mm to 2000 mm, preferably 1200 mm to 1700 mm, preferably equal to 1518 mm.
 8. Machine according to any of the previous claims, comprising a movable flats device (30) comprising a plurality of flats (32) translating along a closed circuit comprising a working section parallel to the work surface of the cylinder (20).
 9. Machine according to claim 8, wherein a main carding zone defined between an initial diametrical line (34), wherein the movable flats disengage from the cylinder, and an end diametrical line (36), wherein the translating flats begin engagement with the cylinder, has an angular extension of 80° to 150°, preferably 90° to 140°, preferably 100° to 130°, preferably equal to 120°.
 10. Machine according to any of the previous claims, wherein the working diameter of the cylinder (20) is 1000 millimetres to 1200 millimetres, preferably 1000 to 1100 millimetres, preferably equal to 1006 millimetres.
 11. Machine according to any of the previous claims, comprising a support frame (60) to support the briseur, the cylinder and the doffer, comprising an entrance frame (66) to support the briseur (12), a central frame (64) to support the cylinder (20), and an exit frame (62) to support the doffer, each formed of respective columns axially spaced, wherein the central frame (64) extends vertically at a greater height than that of the entrance and exit frames alongside it.
 12. Machine according to claim 11, wherein the frame (60) comprises reinforcement cross-members (68) which axially join the columns, to stiffen the structure.
 13. Machine according to claim 11 or 12, comprising transmission organs for the transmission of movement from the electric motors to the briseur, to the cylinder and to the doffer, said transmission organs being connected to the sides of the briseur, of the cylinder and of the doffer above working height, preventing interference with the central frame (64).
 14. Carding machine (10) of a line preparing fibre for spinning, comprising:
 - a briseur (12) rotatable for taking the fibre in tufts from an upstream feed silo;
 - a cylinder (20) counter-rotating in relation to the briseur (12), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and
 - dragging said fibre in rotation onto its own lateral surface; and
 - a doffer (40) counter-rotating in relation to the cylinder (20), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and
 - dragging said fibre in rotation onto its own lateral surface;
 wherein:

a horizontal plane passing through the centre of the cylinder (20) defines a horizontal diametrical line (38);

the straight line passing through the centre of the cylinder (20) and the centre of the briseur (12) defines a briseur- cylinder transfer line (22); and

the straight line passing through the centre of the cylinder (20) and the centre of the doffer (40) defines a cylinder-doffer transfer line (56);

and wherein a total carding zone defined between the briseur-cylinder transfer line (22) and the cylinder-doffer transfer line (42) in the sequence now said and in the direction of rotation of the cylinder, has an angular width of more than 255° and less than 290°, preferably more than 280° and less than 285°, specifically equal to 284°.

15. Carding machine (10) of a line preparing fibre for spinning, comprising:

a briseur (12) rotatable for taking the fibre in tufts from an upstream feed silo;

a cylinder (20) counter-rotating in relation to the briseur (12), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and

dragging said fibre in rotation onto its own lateral surface; and

a doffer (40) counter-rotating in relation to the cylinder (20), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and

dragging said fibre in rotation onto its own lateral surface;

wherein:

a horizontal plane passing through the centre of the cylinder (20) defines a horizontal diametrical line (38);

the straight line passing through the centre of the cylinder (20) and the centre of the briseur (12) defines a briseur- cylinder transfer line (22); and

the straight line passing through the centre of the cylinder (20) and the centre of the doffer (40) defines a cylinder-doffer transfer line (56);

and wherein the lower pre-carding zone defined between the horizontal diametrical line and the briseur-cylinder transfer line (22), has an angular width of more than 40°, and less than 60°, preferably more than 45° and less than 55°, preferably equal to 52°.

16. Carding machine (10) of a line preparing fibre for spinning, comprising:

a briseur (12) rotatable for taking the fibre in tufts from an upstream feed silo;

a cylinder (20) counter-rotating in relation to the briseur (12), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and

dragging said fibre in rotation onto its own lateral surface; and

a doffer (40) counter-rotating in relation to the cylinder (20), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and

dragging said fibre in rotation onto its own lateral surface;

wherein:

a horizontal plane passing through the centre of the cylinder (20) defines a horizontal diametrical line (38);

the straight line passing through the centre of the cylinder (20) and the centre of the briseur (12) defines a briseur- cylinder transfer line (22); and

the straight line passing through the centre of the cylinder (20) and the centre of the doffer (40) defines a cylinder-doffer transfer line (56);

and wherein the area under the cylinder defined between the cylinder-doffer transfer line (42) and the briseur-cylinder transfer line (22), in the sequence now said and

in the direction of rotation of the cylinder, has an angular width of more than 70° and less than 100°,

preferably more than 75° and less than 90°, specifically equal to 76°.

17. Carding machine (10) of a line preparing fibre for spinning, comprising:

a briseur (12) rotatable for taking the fibre in tufts from an upstream feed silo;

a cylinder (20) counter-rotating in relation to the briseur (12), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and

dragging said fibre in rotation onto its own lateral surface; and

a doffer (40) counter-rotating in relation to the cylinder (20), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and

dragging said fibre in rotation onto its own lateral surface;

wherein the working diameter of the cylinder (20) is 1000 millimetres to 1200 millimetres, preferably 1000 to 1100 millimetres, preferably equal to 1006

millimetres.

- 18.** Machine according to claim 17, wherein the working height is 1000mm to 2000 mm, preferably 1200 mm to 1700 mm, preferably greater than 1300 millimetres, preferably to 1518 mm. 5

- 19.** Carding apparatus (100) comprising:

a feed silo (102) of the fibre in tufts; 10
a carding machine (10) downstream of the feed silo, made according to any of the claims from 1 to 13 or 14 or 15 or 16 or 17 or 18;
a coiler group (200) downstream of the carding machine (10), to collect the web in cans. 15

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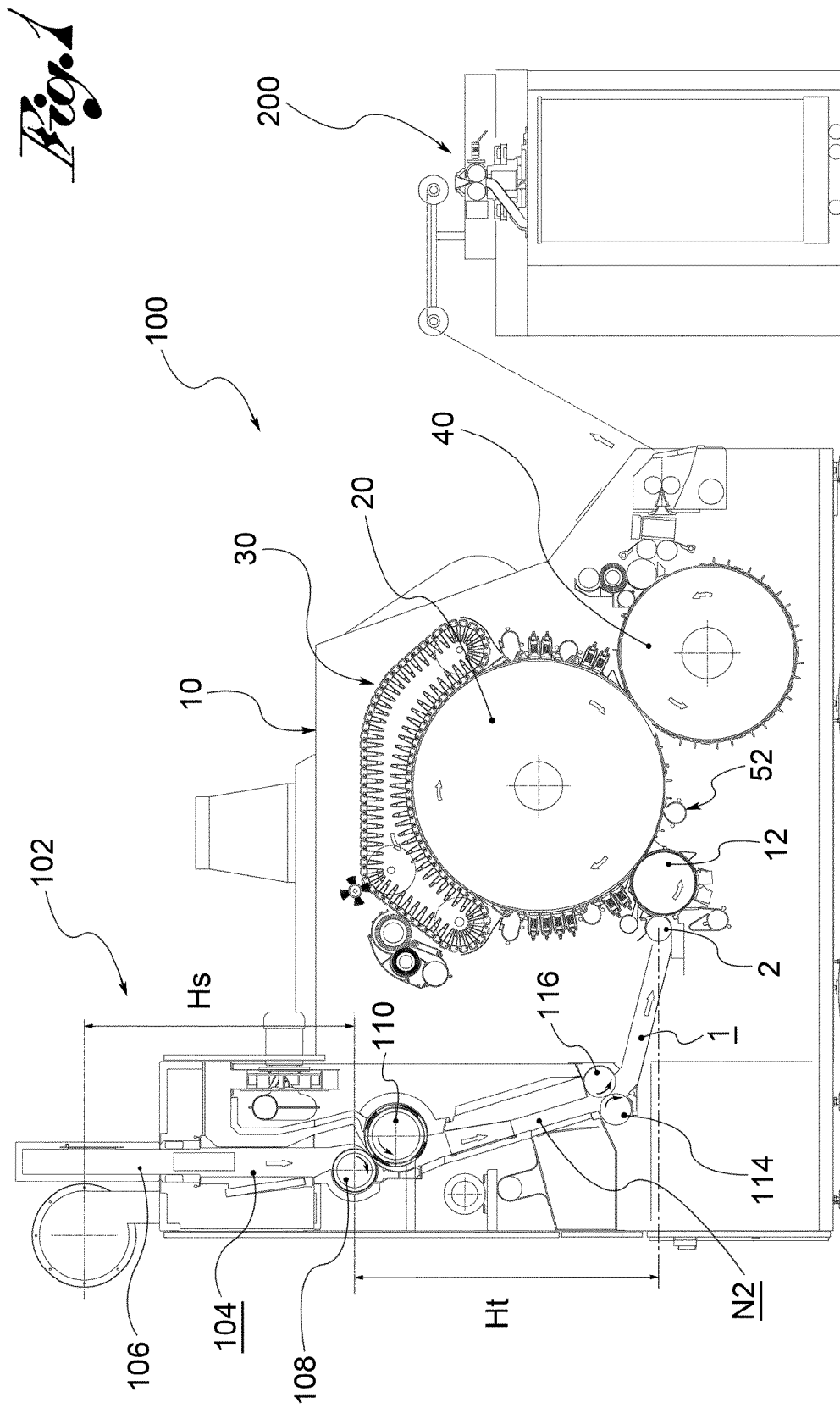
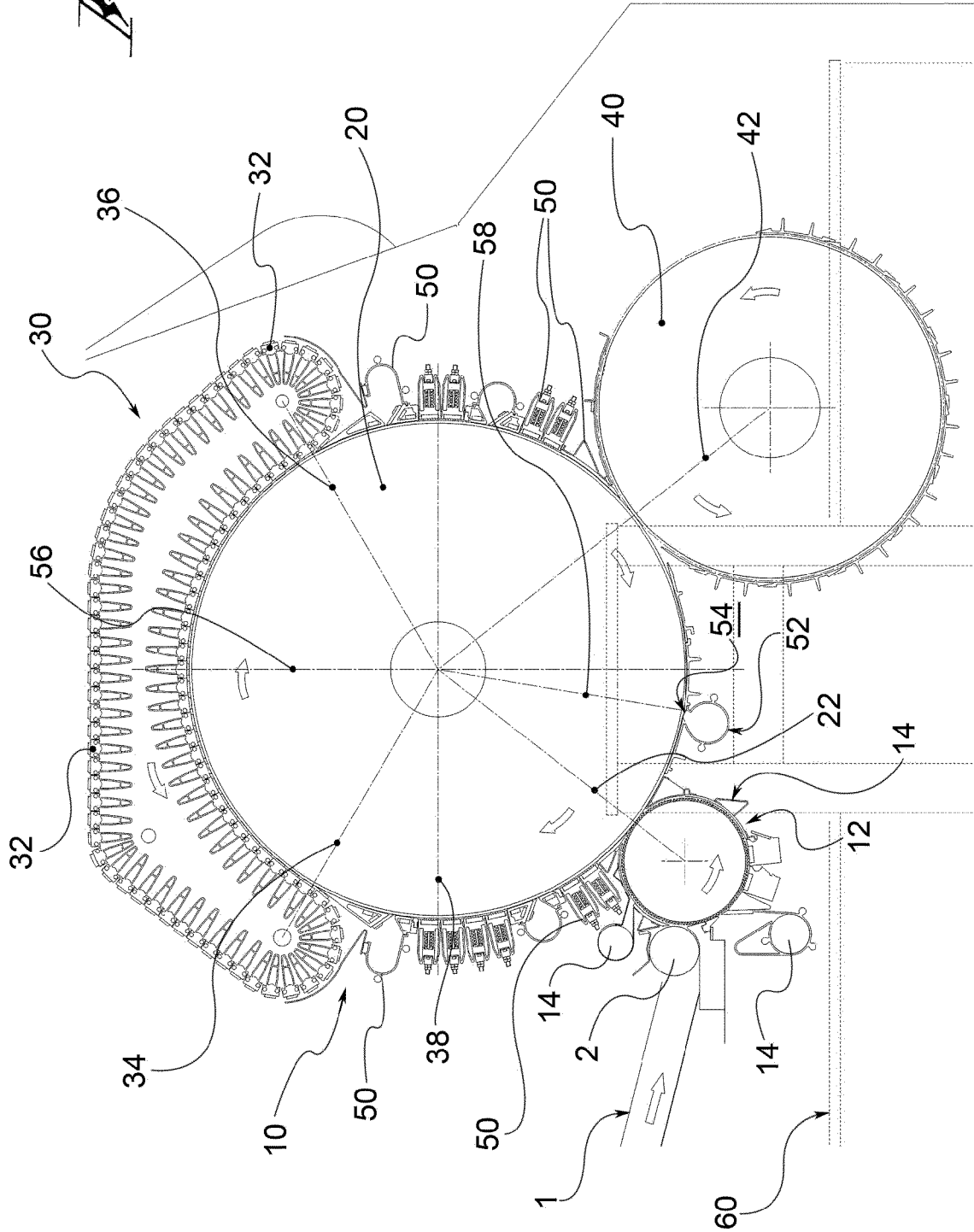


Fig. 2



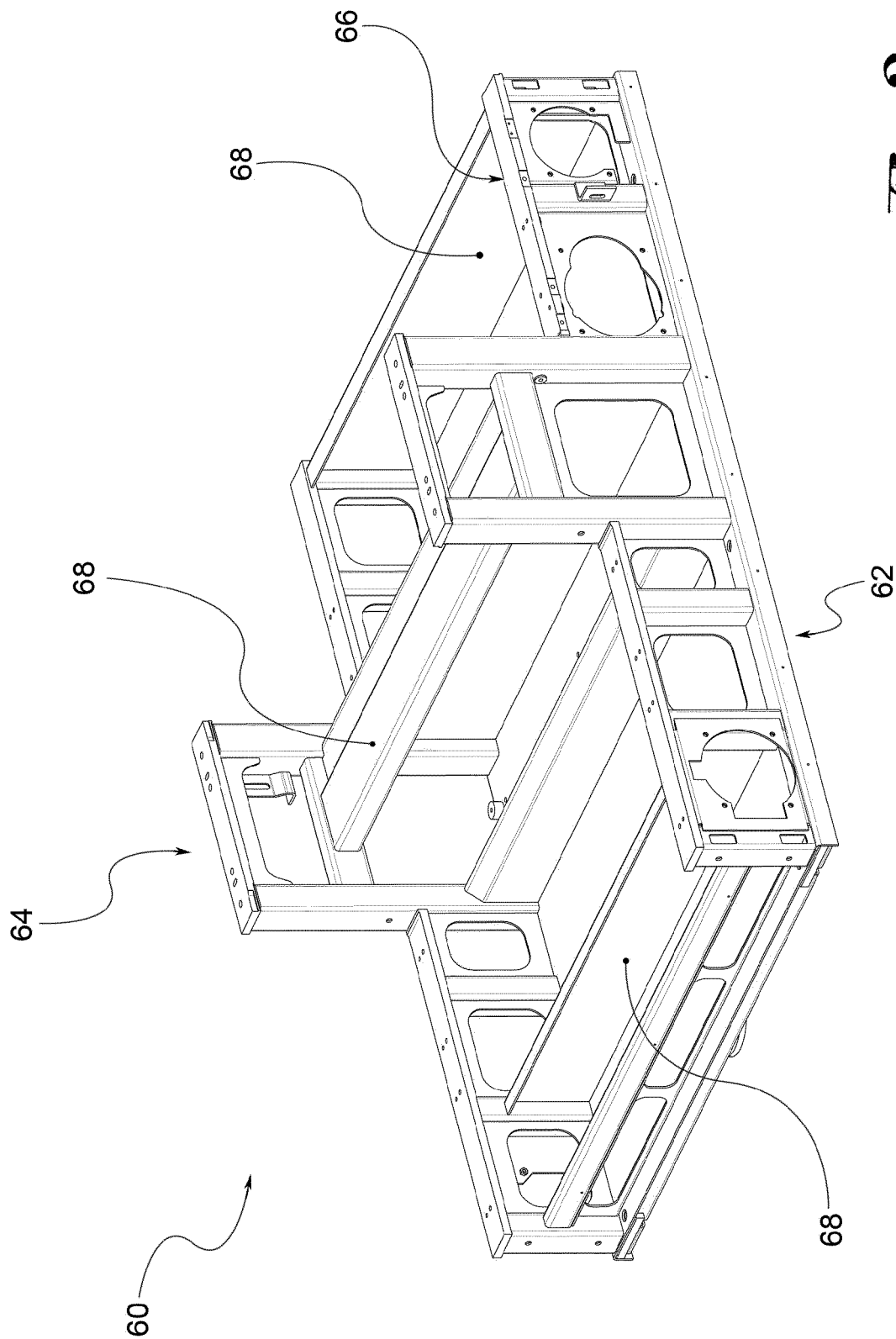


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 7883

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2007/033503 A1 (RIETER AG MASCHF [CH]; GRESSER GOETZ THEODOR [CH]) 29 March 2007 (2007-03-29) * claim 1; figure 1 * -----	1-13,19	INV. D01G15/26 D01G15/32
			TECHNICAL FIELDS SEARCHED (IPC)
			D01G
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 20 June 2012	Examiner Dupuis, Jean-Luc
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 12 16 7883

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2007/033503 A1 (RIETER AG MASCHF [CH]; GRESSER GOETZ THEODOR [CH]) 29 March 2007 (2007-03-29) * claim 1; figure 1 * -----	1-13,19	INV. D01G15/26 D01G15/32
			TECHNICAL FIELDS SEARCHED (IPC)
			D01G
<p>1 The present search report has been drawn up for all claims</p>			
Place of search Munich		Date of completion of the search 20 June 2012	Examiner Dupuis, Jean-Luc
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

EPO FORM 1503 03.82 (P04C01)



Application Number

EP 12 16 7883

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-13(completely); 19(partially)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

Application Number

EP 12 16 7883

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-13(completely); 19(partially)

claims 1-13 and 19 partly address a carding machine of a line preparing fibre for spinning, comprising: a briseur rotatable for taking the fibre in tufts from an upstream feed silo, a cylinder counter-rotating in relation to the briseur, positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface; and a doffer counter-rotating in relation to the cylinder, positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface; wherein: a horizontal plane passing through the centre of the cylinder defines a horizontal diametrical line, the straight line passing through the centre of the cylinder and the centre of the briseur defines a briseur-cylinder transfer line; and the straight line passing through the centre of cylinder and the centre of the doffer defines a cylinder-doffer transfer line.

and wherein the lower post-carding area angularly defined between the horizontal diametrical line (38) and the cylinder-doffer transfer line (42), has an angular width of more than 50°, preferably 52°.

2. claims: 14(completely); 19(partially)

Claims 14 and 19 partly address a carding machine of a line preparing fibre for spinning, comprising: a rotatable briseur for taking the fibre in tufts from an upstream feed silo; a cylinder counter-rotating in relation to the briseur, positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface; and a doffer counter-rotating in relation to the cylinder, positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface; wherein a horizontal plane passing through the centre of the cylinder defines a horizontal diametrical line, the straight line passing through the centre of the cylinder and the centre of the briseur defines a briseur-cylinder transfer line; and the straight line passing through the centre of the cylinder and the centre of the doffer defines a cylinder-doffer transfer line; and wherein a total carding area defined between the briseur-cylinder transfer line and the cylinder-doffer transfer line in the sequence now said and in the direction of rotation of the cylinder, has an angular width of more than 255° and less than 290°, preferably more than



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 12 16 7883

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

280° and less than 285°, specifically equal to 284°.

3. claims: 15(completely); 19(partially)

Claims 15 and 19 partly address a carding machine of a line preparing fibre for spinning, comprising: a rotatable briseur for taking the fibre in tufts from an upstream feed silo; a cylinder counter-rotating in relation to the briseur, positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface; and a doffer counter-rotating in relation to the cylinder, positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface; wherein: a horizontal plane passing through the centre of the cylinder defines a horizontal diametrical line.

- the straight line passing through the centre of the cylinder (20) and the centre of the briseur (12) defines a briseur-cylinder transfer line (22); and

- the straight line passing through the centre of the cylinder (20) and the centre of the doffer (40) defines a cylinder- doffer transfer line (56);

wherein the lower pre-carding area defined between the horizontal diametrical line and the briseur-cylinder transfer line (22), has an angular width of more than 40°, and less than 60°, preferably more than 45° and less than 55°, preferably equal to 52°.

4. claims: 16, 19

Claims 16 and 19 address a carding machine of a line preparing fibre for spinning, comprising a rotatable briseur for taking the fibre in tufts from an upstream feed silo, a cylinder counter-rotating in relation to the briseur, positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface ; and a doffer counter-rotating in relation to the cylinder (20), positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface; wherein a horizontal plane passing through the centre of the cylinder defines a horizontal diametrical line; the straight line passing through the centre of the cylinder and the centre of the briseur defines a briseur- cylinder transfer line; and the straight line passing through the centre of the cylinder and the centre of the doffer defines a cylinder-doffer transfer line



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and wherein the area under the cylinder defined between the cylinder?doffer transfer line (42) and the briseur? cylinder transfer line (22), in the sequence now said and in the direction of rotation of the cylinder, has an angular width of more than 700 and less than 1000, preferably more than 75° and less than 90°, specifically equal to 76°.

5. claims: 17, 18(completely); 19(partially)

Claims 17, 18 and 19 partly address a carding machine of a line preparing fibre for spinning, comprising a rotatable briseur for taking the fibre in tufts from an upstream feed silo; a cylinder counter-rotating in relation to the briseur, positioned downstream of it and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface ; and a doffer counter-rotating in relation to the cylinder, positioned downstream of It and suitable to engage it peripherally, taking the fibre from it and dragging said fibre in rotation onto its own lateral surface; wherein the working diameter of the cylinder is 1000 millimetres to 1200 millimetres, preferably 1000 to 1100 millimetres, preferably 1006 millimetres.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0866153 A [0006]